PATENT ABSTRACTS OF JAPAN

(11)Publication number : 11-250572
(43)Date of publication of application : 17.09.1999

(51)Int.Cl. G11B 20/10
G11B 7/00
G11B 7/007
G11B 20/12

(21)Application number : 10-246406
(22)Date of filing : 31.08.1998
(71)Applicant : SONY CORP
(72)Inventor : KOBAYASHI SHOEI
OWA HIDEO

(30)Priority
Priority number : 09369262 Priority date : 29.12.1997 Priority country : JP

(54) OPTICAL DISK AND ITS RECORDING METHOD

(57)Abstract:
PROBLEM TO BE SOLVED: To record discriminative information peculiar to each optical disk by showing the discriminative information with the recording positions of prescribed amounts of data recorded on respective recording areas of plural sectors having a header area and the recording area.
SOLUTION: The data recording surface of the optical disk 1 is made a sector structure divided to radial areasand furtherplural zones Z0-Zn dividing the data recording surface to concentric circles are provided. Each sector is constituted of a data writing recording area AR2 succeedingly to a header area AR1 written with an address in the front. The header areas AR1 are arranged scatteredly on the disk land address information in sector unit are recorded on themand the header area AR1 is made a length equivalent to a fixed period of a groove GR. The recorded data on the recording area AR2 are rewritten frequentlyand are provided with a fixed data amount to be recorded collectively. The optical disk 1 is provided with the peculiar discriminative informationand the discriminative information is specified by the recording position of the recorded data in the recording area AR2 of each sector.

CLAIMS

[Claim(s)]

[Claim 1]An optical discwherein a recording position of data of the specified quantity which has two or more sectors which consist of a header area and a record sectionand is recorded in a record section for every above-mentioned sector shows identification information.

[Claim 2]The optical disc according to claim 1wherein a part of above-mentioned identification information is specified by recording position of predetermined data recorded in a record section for every above-mentioned sector and other portions of the above-mentioned identification information are recorded on the above-mentioned record section.

[Claim 3]The optical disc according to claim 1 by which identification information of 1 bits or more being shown by whether a recording position of the above-mentioned predetermined data is biased at the head side of the above-mentioned record sectionor it is biased at the back side of the above-mentioned record section.

[Claim 4]The optical disc according to claim 1wherein a header of the above-mentioned sector comprises a pit address.

[Claim 5]The optical disc according to claim 1wherein an address of the above-mentioned sector is formed by wobbling of a groove and/or a land.

[Claim 6]The optical disc according to claim 1wherein the above-mentioned identification information is a specific number.

[Claim 7]The optical disc according to claim 1wherein the above-mentioned identification information is an encryption key for performing encryption processing to data.

[Claim 8]Have two or more sectors which consist of a header area and a record sectionand the above-mentioned identification information of an optical disc which a recording position of data of the specified quantity shows identification information is used into a record section for every above-mentioned sector1st encryption processing is performed to a disk key for performing encryption processing to an inner user datum of data of the above-mentioned specified quantity2nd encryption processing is performed to a sector key for performing encryption processing for every program of the above-mentioned user datum using a disk key to which encryption processing of the above 1st was performedA record method of an optical disc recording an user datum which performed 3rd encryption processing to the above-mentioned user datumand to which the above 1st thru/or 3rd encryption processing were performed at least on a record section of the above-mentioned optical disc using a sector key to which 2nd encryption processing was performed.

[Claim 9]When generating a timing signal based on the above-mentioned identification information and recording data of the above-mentioned specified quantityA record method of the optical disc according to claim 8 recording the above-mentioned identification information by changing a recording position of the above-mentioned specified quantity data recorded in a record section for every sector of an optical disc based on the above-mentioned timing signal.
[Claim 10]When generating a timing signal based on a part of above-mentioned identification information and recording data of the above-mentioned specified quantityWhile recording a part of above-mentioned identification information by changing a recording position of data of the above-mentioned specified quantity recorded in a record section for every sector of an optical disc based on the above-mentioned timing signalA record method of the optical disc according to claim 8 characterized by what is recorded on the above-mentioned record section by making other portions of the above-mentioned identification information into the above-mentioned user datum.
[Claim 11]A record method of the optical disc according to claim 8 characterized by performing encryption processing of the above 1st using identification information which read and read the above-mentioned identification information based on a recording position of predetermined data recorded in a record section for every above-mentioned sector of the above-mentioned optical disc.
[Claim 12]An optical discwherein a recording position of data of the specified quantity which has two or more segments which consist of a header area and a record sectionand is recorded in a record section for every above-mentioned segment shows identification information.
[Claim 13]The optical disc according to claim 12 constituting 1 bit of identification information by two or more segments.
[Claim 14]The optical disc according to claim 13 two or more segments' constituting an error correction blockand constituting 1 bit of identification information by two segments in an error correction block.
[Claim 15]The optical disc according to claim 13 constituting 1 bit of identification information by two error correction blocks.
[Claim 16]The optical disc according to claim 12wherein a recording position of a synchronized signal shows identification information to record data including a synchronized signal.
[Claim 17]Have two or more segments which consist of a header area and a record sectionand the above-mentioned identification information of an optical disc which a recording position of data of the specified quantity shows identification information is used into a record section for every above-mentioned segment1st encryption processing is performed to a disk key for performing encryption processing to an inner user datum of data of the above-

mentioned specified quantity2nd encryption processing is performed to a sector key for performing encryption processing for every program of the above-mentioned user datum using a disk key to which encryption processing of the above 1st was performedA record method of an optical disc recording an user datum which performed 3rd encryption processing to the above-mentioned user datumand to which the above 1st thru/or 3rd encryption processing were performed at least on a record section of the above-mentioned optical disc using a sector key to which 2nd encryption processing was performed.
[Claim 18]When generating a timing signal based on the above-mentioned identification information and recording data of the above-mentioned specified quantityA record method of the optical disc according to claim 17 recording the above-mentioned identification information by changing a recording position of the above-mentioned specified quantity data recorded in a record section for every segment of an optical disc based on the above-mentioned timing signal.
[Claim 19]When generating a timing signal based on a part of above-mentioned identification information and recording data of the above-mentioned specified quantityWhile recording a part of above-mentioned identification information by changing a recording position of data of the above-mentioned specified quantity recorded in a record section for every segment of an optical disc based on the above-mentioned timing signalA record method of the optical disc according to claim 17 characterized by what is recorded on the above-mentioned record section by making other portions of the above-mentioned identification information into the above-mentioned user datum.
[Claim 20]A record method of the optical disc according to claim 17 characterized by performing encryption processing of the above 1st using identification information which read and read the above-mentioned identification information based on a recording position of predetermined data recorded in a record section for every above-mentioned segment of the above-mentioned optical disc.
[Claim 21]A record method of the optical disc according to claim 17 which reads identification information which constituted 1 bit by two or more segments from the above-mentioned optical discand is characterized by performing encryption processing of the above 1st using read identification information.
[Claim 22]Identification information which constituted an error correction block by two or more segmentsand constituted 1 bit by two segments in an error correction block is read from the above-mentioned optical discA record method of the optical disc according to claim 17 characterized by performing encryption processing of the above 1st using read identification information.
[Claim 23]A record method of the optical disc according to claim 17 which

reads identification information which constituted 1 bit by two error correction blocks from the above-mentioned optical discand is characterized by performing encryption processing of the above 1st using read identification information.
[Claim 24]A record method of the optical disc according to claim 17 which detects identification information shown to record data by recording position of a synchronized signal including a synchronized signal with a recording position of a synchronized signal from the above-mentioned optical discand is characterized by performing encryption processing of the above 1st using detected identification information.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to an optical disc which prevented the illegal copy of dataand a record method for the same.
[0002]
[Description of the Prior Art]The recording and reproducing device of the so-called recordable phase change type optical disc of a DVD-RAM disk etc. enciphers the AV information which consists of a video signalan audio signaletc.and records it on an optical disc. In the time of playbackthe original video signal and audio signal can be acquired by decoding the AV information read from the optical disc.
[0003]The above-mentioned recording and reproducing device enciphers the sector key for enciphering AV information for every program using the disk key for enciphering the whole AV information recorded on an optical disc (encryption)as shownfor example in drawing 14. And while enciphering AV information for every program using the enciphered disk key and recording on an optical disca disk key and the enciphered sector key are also recorded on an optical disc.
[0004]At the time of reproductionthe above-mentioned recording and reproducing device decodes a sector key using a disk key and the enciphered sector key (decryption)and decodes the AV information enciphered using this sector key.
[0005]Generally such concrete contents of encryption processing and decoding processing are not exhibited from a viewpoint of illegal copy prevention. Thereforeunless the composition of IC (Integrated Circuit) which performs encryption processing of the above-mentioned recording and reproducing device etc. is knownthe general user cannot copy AV information illegally.
[0006]If the same data as the place where an above-mentioned phase change type

optical disc is the same is recorded repeatedlya recording mark and its circumference will deteriorate by thermal stress etc. Therebythe characteristic that the above-mentioned optical disc can record repeated data might be restricted. Thenthe technique of changing the recording position at randomi.e.SPS (Start Position Shift method) recordis taken so that the position of the synchronizing signal part which has the same signal pattern may not be recorded on the same place.

[0007]

[Problem(s) to be Solved by the Invention]Howeverwhen the composition of IC which performs encryption processing of the above-mentioned recording and reproducing device etc. is knownthe technique of decoding processing of solving the code is knownand there is a possibility that the AV information currently recorded on the original optical disc by this may be copied to other optical discs.

[0008]The concern about securitysuch as anti-copyingtakes for risingand the demand of prevention of an illegal copy is increasing by it not only enciphering the contents of the optical discbut putting individual identification information into an optical disc.

[0009]This invention is proposed in view of such the actual conditionand is a thing.

Even if the data of an optical disc is copied illegally by recording an identification number on an optical disc using the purposeit is providing an optical disc which can make playback of the data impossibleand a record method for the same.

[0010]

[Means for Solving the Problem]In order to solve above-mentioned SUBJECTan optical disc concerning this invention has two or more sectors which consist of a header area and a record sectionand a recording position of data of the specified quantity recorded in a record section for every sector shows identification information.

[0011]An optical disc concerning this invention has two or more segments which consist of a header area and a record sectionand a recording position of data of the specified quantity recorded in a record section for every segment shows identification information.

[0012]A record method of an optical disc concerning this invention has two or more sectors which consist of a header area and a record sectionIdentification information of an optical disc in which a recording position of data of the specified quantity is recorded in a record section for every sector is used1st encryption processing is performed to a disk key for performing encryption processing to an inner user datum of data of the specified quantity2nd

encryption processing is performed to a sector key for performing encryption processing for every program of an user datum using a disk key to which 1st encryption processing was performedAn user datum which performed 3rd encryption processing to an user datum and to which encryption processing was performed is recorded on a record section of an optical disc using a sector key to which 2nd encryption processing was performed.
[0013]A record method of an optical disc concerning this inventionHave two or more segments which consist of a header area and a record sectionand identification information of an optical disc in which a recording position of data of the specified quantity is recorded in a record section for every segment is used1st encryption processing is performed to a disk key for performing encryption processing to an inner user datum of data of the specified quantity2nd encryption processing is performed to a sector key for performing encryption processing for every program of an user datum using a disk key to which 1st encryption processing was performedAn user datum which performed 3rd encryption processing to an user datum and to which encryption processing was performed is recorded on a record section of an optical disc using a sector key to which 2nd encryption processing was performed.
[0014]Identification information of an optical disc is used in a record method of an optical disc concerning this invention1st encryption processing is performed to a disk key for performing encryption processing to an inner user datum of data of the specified quantity2nd encryption processing is performed to a sector key for performing encryption processing for every program of an user datum using a disk key to which 1st encryption processing was performedDifferent encryption processing for every optical disc is performed by performing 3rd encryption processing to an user datum using a sector key to which 2nd encryption processing was performed.
[0015]
[Embodiment of the Invention]Hereafteran embodiment of the invention is described in detailreferring to Drawings.
[0016]This invention is applied to the optical disc 1 of composition as shownfor example in drawing 1.
[0017]The above-mentioned optical disc 1 divides a data recording surface on a concentric circleand forms two or more zones ZO-Zn while it divides a data recording surface into a radiate field and forms sector structure.
[0018]Each sector is assigned to header area AR1 in which an address is written for a headand recording area AR2 in which data is written for the continuing remaining fields. In recording area AR2the groove GR moves in a zigzag directionand is formed. In the track of the zone ZO of the most inner circumferenceit is formed so that the number of meandering of the groove GR may increase one by oneas it is formed so that the groove GR may move in a

zigzag direction covering a predetermined cycleand it moves to the zone by the side of a periphery. Header area AR1 is discretely allotted on an optical discand the address information of a sector unit is recorded. In header area AR1the length equivalent to the constant period of the groove GR is assigned.
[0019]Herein the first half of header area AR1the embossed pit train of the groove header GRH is formed on the track center by the groove GR. In the latter half of header area AR1the embossed pit train of land header LH is formed on the track center by a land.
[0020]Header area AR1 of the above-mentioned optical disc 1 comprises "Header1"GapHeader2and "Gap"as shown in (A) of drawing 2. The information according ["Header1"] to a groove header GRH embossed pit train correspondsand the information according ["Header2"] to the embossed pit train of land header LH corresponds. "Header1" and "Header2"It comprises ""ID1" and "ID2" which show "AM1"AM2and ID "VFO1" and "VFO2" which show "SM" and the timing data for a synchronization in which a sector mark is shownand an address mark are indicated to bePA1" which show a postamble.
[0021]Recording area AR2 of the above-mentioned optical disc 1As "Guard1" which is guard areas of a recording startVFOwhich is timing data for a synchronizationSYNCwhich shows the starting position of dataand the Lord. It comprises "Guard2" and "Buffer" which are guard areas of "DATA"a postamble "PA"and the end of record which are data recorded.
[0022]In recording area AR2the data (henceforth "record data") which consists of "VFO"SYNCa "DATA"and "PA" consists of data of the AV information of a video signal and an audio signalother synchronization informationetc.and is rewritten frequently. The above-mentioned record data has a constant rate of data volumeand as a slash is given and shown in drawing 2it becomes a bundle and it is recorded. Each optical disc 1 is provided with peculiar identification information (henceforth "media ID"). This media ID is specified by the recording position of the above-mentioned record data in recording area AR2 for every sector. When record data is rewrittenthe above-mentioned record data itself is only rewrittenand the recording position does not change. Therebyeven if record data is rewrittenmedia ID changes. When changing media IDa recording position is changed anew.
[0023]It is called SPS (Start Position Shift method) record by the following explanation by shifting the recording position of AV information in this way to record media ID.
[0024]In SPS recordmedia ID for 1 bit is recordedfor example with one sector (8 K bytes). For examplein recording area AR2as shown in (B) of drawing 2when the field of "Guard1" becomes small and the field of "Guard2" becomes largethe record data which consists of the above "VFO" etc. biases ahead of recording area AR2and is recorded. At this timemedia ID for 1 bit shows "0."

[0025]As shown in (C) of drawing 2when the field of "Guard1" becomes large and the field of "Guard2" becomes smallthe record data which consists of the above "VFO" etc. is biased and recorded behind recording area AR2. At this timemedia ID for 1 bit shows "1." And media ID is specified when these 1-bit information for every sector gathers.
[0026]SPS record of all the information on media ID may be carried outand SPS record of a part of information on media ID may be carried out. Media ID shall consist of 128 bits in the following explanation.
[0027]For exampleSPS record of all the 128-bit information on media ID is carried out as follows. For exampleas shown in (A) of drawing 3media ID for 1 bit is recorded on one sector. Since 1 ECC block comprises eight sectorsas shown in (B) of drawing 38-bit media ID is recorded on 1 ECC block. Thereforeas shown in (C) of drawing 3128-bit media ID will be recorded on 16 ECC blocks.
[0028]SPS record of a part of information on media ID may be carried outand other information on media ID may be recorded on recording area AR2. For exampleas shown in (A) of drawing 4and (B) of drawing 4SPS record of 8 bits may be carried out among 128-bit media IDand remaining 120 bits may be recorded on recording area AR2.
[0029]As media IDinformationincluding the manufacturer of a number peculiar to an optical discan encryption keyand the optical disc 1contents production personsa signaturea dateetc. correspondsfor example.
[0030]The rough composition of the recording and reproducing device 10 which performs decoding processing to the data which performed encryption processing to the above-mentioned optical disc 1and recorded AV information nextand was recorded on the above-mentioned optical disc 1and plays AV information is explained using drawing 5.
[0031]The above-mentioned recording and reproducing device 10 is provided with the following.
The Records Department 11 which performs encryption processing of AV information and records on the optical disc 1.
The regenerating section 15 which performs decoding processing to the AV information played from the optical disc 1.

[0032]At the Records Department 11the 1st enciphering circuit 12 enciphers the disk key for enciphering the whole AV information using media ID peculiar to the optical disc 1. The 2nd enciphering circuit 13 carries out encryption processing to the sector key for enciphering AV information for every program using this enciphered disk key. The 3rd enciphering circuit 14 enciphers AV information for every program using the enciphered sector key. And while the enciphered AV information is recorded on the optical disc 1a disk key and the

enciphered sector key are also recorded on the optical disc 1.
[0033]Thusthe recording and reproducing device 10 can perform different encryption processing to the one-sheet optical disc 1 of one sheet by performing encryption processing of AV information using media ID peculiar to the optical disc 1.
[0034]On the other handin the regenerating section 15the 1st decoder circuit 16 decodes the disk key enciphered using media ID of the optical disc 1. The 2nd decoder circuit 17 decodes the sector key enciphered using this disk key. The 3rd decoder circuit 18 decodes the AV information enciphered using this sector key. Thuswhen the recording and reproducing device 10 decodes AV information using media ID of the optical disc 1For examplesince media ID of an original optical disc differs from media ID of the optical disc in which the AV information copied illegally is recorded even if it is a case where it is copied illegally as it is from other optical discsthe AV information copied illegally can be prevented from being decoded.
[0035]The concrete circuitry of the recording and reproducing device 20 which uses drawing 6and records AV information on the above-mentioned optical disc 1 nextor plays the AV information of the above-mentioned optical disc 1 is explained.
[0036]The above-mentioned recording and reproducing device 20 is provided with the following.
The optical head 21 which performs record/reproduction of data via a laser beam.
The record / regenerative circuit 22 which performs predetermined abnormal-conditions/recovery processing etc. to AV information
The address detection circuit 23 which detects the address of the AV information read from the optical disc 1.
The wobble signal detection circuit 26 which detects a wobble signaland the wobbling period detection circuit 27 which detects the cycle of the above-mentioned wobble signalThe PLL (Phase Locked Loop) circuit 28 which generates a predetermined clock based on the above-mentioned wobble signalthe cluster counter 29 which counts the position of an addressthe system control circuit 30 which controls each circuitand ROM31 predetermined data is remembered to be.

[0037]The optical head 21 records the AV information supplied via the system control circuit 30and the record/regenerative circuit 22 on the optical disc 1. Herethe system control circuit 30 performs encryption processing later mentioned to the AV information inputtedand supplies it to record / regenerative circuit 22. After record / regenerative circuit 22 performs error correcting code processinga modulation processetc. to the data supplied from the system control circuit 30it is supplied to the optical head 21.

[0038]The optical head 21 mentioned above supplies the detect output of the catoptric light from the optical disc 1 of a laser beam to record / regenerative circuit 22the address detection circuit 23and the wobble signal detection circuit 26.
[0039]Record / regenerative circuit 22 performs error correction processingrecovery processingetc. to the AV information supplied from the optical head 21and supplies them to the system control circuit 30. The system control circuit 30 performs and outputs the decoding processing later mentioned to the AV information from record / regenerative circuit 22.
[0040]After the address detection circuit 23 decodes address information from the detect output of the optical head 21 and performs detection of an erroretc.it supplies the decoded address to the cluster counter 29 and the system control circuit 30.
[0041]The wobble signal detection circuit 26 is provided with the following.
The band pass filter (BPF) 26a for removing a noise component from a wobble signal.
The comparator 26b which performs binarization processing.
The detect output (wobble signal) of wobbling of the groove and/or land which are recorded on the optical disc 1 is supplied to BPF26a via the optical head 21. BPF26a removes the noise of the above-mentioned wobble signaland supplies it to the comparator 26b. The comparator 26b carries out binarization processing to the wobble signal from BPF26aobtains a wobbling detection pulseand supplies this wobbling detection pulse to the wobbling period detection circuit 27.
[0042]The wobbling period detection circuit 27 will be supplied to PLL circuit 28if the periodicity of the above-mentioned wobbling detection pulse is judged and this has fixed periodicity. When it does not have fixed periodicitya servo draws and it is working.
[0043]PLL circuit 28 is provided with the following.
Phase comparator 28a.
The low-pass filter (LPF) 28b from which the noise component of high frequency is removed.
Voltage controlled oscillator (VCO) 28c.
Counting-down circuit 28d.

[0044]The phase comparator 28a compares the phase of the wobbling detection pulse from the wobbling period detection circuit 27and the pulse from the counting-down circuit 28dand supplies the phase-comparison error signal which shows the error of the phase to VCO28c via LPF28b. VCO28c generates a channel clock (henceforth a "R/W clock") based on the above-mentioned phase-comparison error signaland supplies this to the counting-down circuit 28d and the cluster

counter 29. A division ratio is controlled by the system control circuit 30and the counting-down circuit 28d carries out dividing of the R/W clock from VCO28cgenerates the pulse of the same frequency as the frequency of a wobble signaland supplies it to the phase comparator 28a. A fixed R/W clock is generated by this processing based on the above-mentioned wobble signal.
[0045]ThusPLL circuit 28 can generate an accurate R/W clock based on the wobble signal acquired from the optical disc landtherebyrecord/playback of data are attained with high density [there is nothing redundantly and].
[0046]The cluster counter 29 performs synchronization signal processing in sync with an address period based on the address from the address detection circuit 23and the R/W clock from VCO28cand counts the position of the next address. When the position of the next address cannot be detectedfrom this counterthe cluster counter 29 determines the position of the next addressand counts up an address.
[0047]The system control circuit 30 controls rotation of the thread motor which is not illustrated based on the address detected by the cluster counter 29The optical head 21 is accessed at the position on an optical discand record of data and/or regeneration are performed according to cluster record reproduction timing. The data of the division ratio of the counting-down circuit 28d corresponding to an address is memorized by ROM31and the system control circuit 30 is controlling the division ratio of the counting-down circuit 28d based on the data of ROM31.
[0048]The system control circuit 30 is provided with the following.
The enciphering processing part 40 shown in drawing 7 in order to perform encryption processing mentioned above.
The decoding processing section 50 shown in drawing 8 in order to perform decoding processing.

[0049]The enciphering processing part 40 performs encryption processing to the AV information further inputted as media ID using the disk key as a cryptographic keyand a sector key. It is for a disk key enciphering the whole AV information recorded on an optical discand a sector key is an enciphering key for enciphering AV information for every program.
[0050]Herethe enciphering processing part 40 is provided with the following.
Separation circuits 41 which separate media ID.
The timing signal generating circuit 42 which generates the SPS timing signal for SPS record.
The 1st enciphering circuit 43 that performs encryption processing of a disk key.
The 2nd enciphering circuit 44 that performs encryption processing of a sector keyand the 3rd enciphering circuit 45 that performs encryption processing of

AV information.

[0051]Media ID is supplied to the separation circuits 41 and the 1st enciphering circuit 43. Hereabove-mentioned media ID consists of 128 bitsand The 8 bits. (it is hereafter called "media ID1".) -- it shall be recorded on the optical disc 1 by SPS recordand other 120 bits (henceforth "media ID2") shall be recorded on recording area AR2

[0052]The separation circuits 41 divide above-mentioned media ID into media ID1 for 8-bit SPS recordand media ID2 for recording area AR2 120-bit record by dividing media ID into 8 bits and 120 bits. And the separation circuits 41 supply media ID1 to the timing signal generating circuit 42and supply media ID2 to the record / regenerative circuit 22 shown in drawing 6.

[0053]Based on media ID1 from predetermined data and the separation circuits 41such as an address read from the optical disc 1the timing signal generating circuit 42The SPS timing signal for changing the recording position of the record data in recording area AR2 is generated and outputtedand this SPS timing signal is supplied to record / regenerative circuit 22.

[0054]On the other handthe 1st enciphering circuit 43 is supplied to record / regenerative circuit 22 while it enciphers a disk key using above-mentioned media ID and supplies the enciphered disk key to the 2nd enciphering circuit 44.

[0055]Using the enciphered disk keythe 2nd enciphering circuit 44 enciphers a sector keyand supplies the enciphered sector key to the 3rd enciphering circuit 45and the record/regenerative circuit 22.

[0056]The 3rd enciphering circuit 45 enciphers the AV information which consists of a video signalan audio signaletc. using the enciphered sector keyand supplies the enciphered AV information to record / regenerative circuit 22.

[0057]And based on the SPS timing signal which is supplied from the system control circuit 30 in record / regenerative circuit 22Change is given to the recording position of the record data of "VFO"DATAetc.etc. by enlarging data volume of "Guard1" in recording area AR2 shown in drawing 2or making it small. Thusby giving change to the recording position of record datamedia ID for 1 bit is recorded on one sectorand media ID1 [8-bit] is part for eight sectors recorded. Record / regenerative circuit 22 records media ID2the enciphered disk keythe enciphered sector keyand the enciphered AV information as record data of "DATA" etc. shown in drawing 2.

[0058]As mentioned abovethe above-mentioned recording and reproducing device 20 can perform encryption processing to AV information using media ID peculiar to the optical disc 1and can record it on the optical disc 1. That isthe above-mentioned recording and reproducing device 20 can record the AV

information which different encryption processing gave to one one-sheet optical disc. About the disk key and sector key which were encipheredwhat may record as record data as mentioned aboveand may carry out SPS record is natural.
[0059]Although the case where media ID and AV information were recorded simultaneously here was explainedWhen media ID is already recorded on the optical disc lafter reading this media IDbased on this media IDit may be made to perform encryption processing of a predetermined key and AV information. SPS record of all the media ID may be carried out via the timing signal generating circuit 42without separating media ID.
[0060]On the other handmedia ID1media ID2the enciphered disk keythe enciphered sector keyand the enciphered AV information are supplied to the decoding processing section 50 via the optical head 21and the record/regenerative circuit 22. And the decoding processing section 50 can decode the enciphered AV information using media ID1 grade.
[0061]The decoding processing section 50 is provided with the following.
The timing signal generating circuit 51 which generates an SPS timing signal as shown in drawing 8.
Media ID1 separation circuits 52 which separate media ID1 from the above-mentioned SPS timing signal.
The synthetic circuit 53 which compounds media ID1 and media ID2.
The 1st decoder circuit 54 that decodes a disk keythe 2nd decoder circuit 55 that decodes a sector keyand the 3rd decoder circuit 56 that decodes AV information.

[0062]The timing signal generating circuit 51 generates an SPS timing signal based on the recording position of the record data of "VFO" of recording area AR2 shown in drawing 2DATAetc.etc.and supplies this to the media ID1 separation circuits 52.
[0063]The media ID1 separation circuits 52 separate media ID1 from an SPS timing signaland supply this to the synthetic circuit 53.
[0064]The synthetic circuit 53 compounds media ID1 from the media ID1 separation circuits 52and media ID2 which were read from the optical disc 1generates media IDand supplies this media ID to the 1st decoder circuit 54.
[0065]The 1st decoder circuit 54 decodes the disk key enciphered using above-mentioned media IDand supplies the decoded disk key to the 2nd decoder circuit 55. Using the decoded disk keythe 2nd decoder circuit 55 decodes the enciphered sector keyand supplies the decoded sector key to the 3rd decoder circuit 56. Using the decoded sector keythe 3rd decoder circuit 56 decodes the enciphered AV informationand outputs the decoded AV information.
[0066]As mentioned abovethe recording and reproducing device 20 is performing

decoding processing of the AV information enciphered using media ID1 [peculiar to the optical disc 1]and media ID2. Thereforethe recording and reproducing device 20 cannot decode AV information from the optical disc 1 in which AV information was copied unjustly. Therebyeven if the AV information of the optical disc of 1 is copied illegally to other optical discs as it isAV information is not decoded butas a resultcan prevent an illegal copy.

[0067]In this embodimentin the above-mentioned recording and reproducing device 20although SPS record of media ID1 shall be carried out and media ID2 shall be recorded as record datathis invention is not limited to this. For examplethe SPS record of media ID (media ID1 and media ID2) may be made to be carried out at the optical disc 1. At this timethe 1st decoder circuit 54 should just be made to perform decoding processing of the disk key enciphered based on media ID which is read from the optical disc 1 and supplied via the timing signal generating circuit 51 and the media ID1 separation circuits 52.

[0068]In the embodiment of the optical disc 1 mentioned abovealthough media ID for 1 bit shall be recorded on one sectorthis invention is not limited to this. For example2-bit media ID is recordable on one sector by distinguishing the recording position of AV informationsuch as "VFO"DATAetc. which are recorded on recording area AR2 shown in drawing 2to four steps. It is possible similarly to record media ID more than a triplet on one sector.

[0069]Although media ID for 1 bit shall be recorded on one sector in the embodiment of the optical disc 1 mentioned aboveFor exampleit may be made for the recording position of the data of the specified quantity recorded in record section AR2 for every above-mentioned segment to show identification informationi.e.media IDin the optical disc 100 which has two or more segments which consist of header area AR1 and record section AR2 as shown in drawing 9.

[0070]The record reproduction field of this optical disc 100 is divided into two or more zones ZO-Zn of concentric circle shape. It is arranged in the shape of CAV (Constant Angular Velocity)storage density becomes the maximum by the most inner circumference of the same zoneand the inside of the same zone is loose towards the outside. It is set up in the most inner circumference of the zone of the adjoining periphery become the same as the storage density of the most inner circumference of the zone of the adjoining inner circumference.

[0071]In this optical disc 100header area AR1 is arranged in the shape of CAVand let from one header area to the header area be one segment. "VFO" for PLL drawing inan address marka track addressa segment addressCRCetc. are consisted of by header area AR1.

[0072]Record reproduction of the record reproduction data is carried out considering an error correction (ECC:Error Check and Correction) block as one unitand the data of 1 ECC block is recorded on two or more segments.

[0073]As shownfor example in drawing 10the recording position information of

the 1st segment and the 2nd segment which constitutes an ECC block constitutes 1 bit of identification information from this optical disc 100.
[0074]For examplethe number of channels of the field shifted by SPS (Start Position Shift method) record is used as 128 channelsThe SPS field of 128 channels is made into the 1st SPS field for from zero channel to 64 channels by dividing into twoand from 65 channels to 128 channels are made into the 2nd SPS field.
[0075]And when both the recording positions of the 1st segment and the 2nd segment are the same SPS fieldsidentification information sets to "0"As shown in (A) of drawing 10when both the recording positions of the 1st segment and the 2nd segment are the 1st SPS fieldsor when [as shown in (B) of drawing 10] both the recording positions of the 1st segment and the 2nd segment are the 2nd SPS fieldsidentification information is set to "0."
[0076]When it is an SPS field where the recording positions of the 1st segment and the 2nd segment differAs identification information sets to "1" and it is shown in (C) of drawing 10when the recording position of the 1st segment is [the recording position of the 2nd segment] the 2nd SPS field in the 1st SPS fieldOr in the 2nd SPS fieldas shown in (D) of drawing 10the recording position of the 1st segment sets identification information to "1"when the recording position of the 2nd segment is the 1st SPS field.
[0077]Although the recording position of SPS is chosen at random1 bit of identification information can consist of two segments by setting up the recording position of the 1st segment in an ECC blockand the 2nd segment as mentioned above.
[0078]Thusthe optical disc 100 which has two or more segments which consist of a header area and a record sectionand the recording position of the data of the specified quantity shows identification information in the record section for every above-mentioned segmentIn accordance with the record method concerning this invention1st encryption processing is performed to the disk key for performing encryption processing to the inner user datum of the data of the above-mentioned specified quantity using the above-mentioned identification information2nd encryption processing is performed to the sector key for performing encryption processing for every program of the above-mentioned user datum using the disk key to which encryption processing of the above 1st was performedThe user datum which performed 3rd encryption processing to the above-mentioned user datum and to which the above 1st thru/or 3rd encryption processing were performed at least is recorded using the sector key to which 2nd encryption processing was performed.
[0079]As shown in drawing 11two ECC blocks can also constitute 1 bit of identification information.
[0080]When both the recording positions of an odd number ECC block and an even

number ECC block are the same SPS fieldsidentification information sets to "0"As shown in (A) of drawing 11when both the recording positions of an odd number ECC block and an even number ECC block are the 1st SPS fieldsor when [as shown in (B) of drawing 11] both the recording positions of an odd number ECC block and an even number ECC block are the 2nd SPS fieldsidentification information is set to "0."

[0081]When it is an SPS field where the recording positions of an odd number ECC block and an even number ECC block differAs identification information sets to "1" and it is shown in (C) of drawing 11when the recording position of an odd number ECC block is [the recording position of an even number ECC block] the 2nd SPS in the 1st SPS fieldOr in the 2nd SPS fieldas shown in (D) of drawing 11the recording position of an odd number ECC block sets identification information to "1"when the recording position of an even number ECC block is the 1st SPS field.

[0082]That isthe recording position of the segment in an ECC block is made the sameand shows 1 bit of identification information with the recording position of an odd number ECC block and an even number ECC block.

[0083]Heredetection of a recording position is performed as follows.

[0084]That isas the recorded information on a segment is shown in drawing 12header area AR1 consists of "GUARD" and "VFO"and data area AR2 consists of an user datum containing "FRAME SYNC."

[0085]"GUARD" is a field for the data protection of the phase change record film containing SPS. "VFO" is a field for PLL drawing in. "FRAME SYNC" is a synchronized signal for taking a synchronization.

[0086]As shown in (A) of drawing 13and (B)FRAMESYNCchanges a recording position with the recording position of SPSAs shown in (A) of drawing 13when the recording position of SPS is from zero channel to 64 channelsthe recording position of "FRAME SYNC" serves as corresponding-to 1st SPS SYNC areaAs shown in (B) of drawing 13when the recording position of SPS is from 65 channels to 128 channelsthe recording position of "FRAME SYNC" serves as SYNC area corresponding to the 2nd SPS. Thereforewhen "FRAME SYNC" is detected in the SYANC area corresponding to the 1st SPSThe recording position of the segment is the 1st SPS fieldand when "FRAME SYNC" is detected in the SYANC area corresponding to the 2nd SPSthe recording position of the segment is the 2nd SPS field.

[0087]That issince the recording position of the synchronized signal shows identification information when a synchronized signal is included in record dataidentification information can be read by detecting the recording position of a synchronized signal.

[0088]The number of channels of the area shifted by SPS may be used as 64 channels or 256 channels depending on mediawithout being limited to 128

channels.
[0089]
[Effect of the Invention]As explained to details aboveaccording to the optical disc concerning this inventionwhen the recording position of the predetermined data which consists of a header area and a record section and which is constituted for every sector and recorded in the record section for every sector shows identification informationidentification information peculiar to each optical disc is recordable.
[0090]According to the optical disc concerning this inventionwhen the recording position of the predetermined data which consists of a header area and a record section and which is constituted for every segment and recorded in the record section for every segment shows identification informationidentification information peculiar to each optical disc is recordable.
[0091]According to the record method of the optical disc concerning this inventionthe identification information of an optical disc is used1st encryption processing is performed to the disk key for performing encryption processing to the whole data2nd encryption processing is performed to the sector key for performing encryption processing for every program of data using the disk key to which 1st encryption processing was performedThe data in which different encryption processing for every optical disc was performed is recordable by recording the data which performed 3rd encryption processing to data and in which encryption processing was performed on the record section of an optical disc using the sector key to which 2nd encryption processing was performed.
[0092]By adopting the SPS (Start Position Shift method) record which changes a recording position at random in a phase change type optical discReliability including the life of the medium can be improved and information can be safely recorded by making this recording position into coding information. And it is not necessary to fix a recording position for every recordand reliability including the life of the medium can be improved by changing a recording position by identifying data by at least two recording position information as the original purpose. The above-mentioned identification information can close an information bit by an ECC blockand can complete it with data information per record of ECC.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]It is a figure for explaining the optical disc which applied this

invention.
[Drawing 2]It is a figure for explaining the format of the above-mentioned optical disc.
[Drawing 3]It is a figure for explaining media ID recorded on the above-mentioned optical disc.
[Drawing 4]It is a figure for explaining media ID recorded on the above-mentioned optical disc.
[Drawing 5]It is a rough lineblock diagram of the recording and reproducing device of the optical disc which applied this invention.
[Drawing 6]It is a block diagram showing the concrete circuitry of the recording and reproducing device of the above-mentioned optical disc.
[Drawing 7]It is a block diagram showing the composition of the enciphering processing part of the system control circuit of the above-mentioned recording and reproducing device.
[Drawing 8]It is a block diagram showing the composition of the decoding processing section of the above-mentioned system control circuit.
[Drawing 9]It is a figure for explaining other examples of the optical disc which applied this invention.
[Drawing 10]It is a figure for explaining how to show identification information in the recording position of two segments which constitute the ECC block in the optical disc shown in drawing 9.
[Drawing 11]It is a figure for explaining how to show identification information in the recording position of two ECC blocks in the optical disc shown in drawing 9.
[Drawing 12]It is a figure for explaining the contents of record of the segment in the optical disc shown in drawing 9.
[Drawing 13]It is a figure for explaining how to detect the recording position which shows the identification information in the optical disc shown in drawing 9.
[Drawing 14]It is a rough lineblock diagram of the recording and reproducing device of the conventional optical disc.
[Description of Notations]
1100 optical discs and 20 [The 1st enciphering circuit and 44 / The 2nd enciphering circuit and 45 / The 3rd enciphering circuit] A recording and reproducing device30 system control circuitsand 40 An enciphering processing part and 41 Separation circuits42 timing signal generating circuitsand 43